Programs and Services

## Farm and Food Report, Week of May 15, 2006

Saskatchewan Sheep Development Board Works On Designing Better Lambs | Watch For Crown Rust On Oats In The Southeast | Is Supplemental Feeding Of Grazing Cattle Feasible? | Progress In The Quest For A More Effective Control Of Gopher Populations

**Week of May 15, 2006**

### SASKATCHEWAN SHEEP DEVELOPMENT BOARD WORKS ON DESIGNING BETTER LAMBS

If the Saskatchewan Sheep Development Board and its partners succeed in a new project, funded in part by Saskatchewan Agriculture and Food's (SAF) Agriculture Development Fund (#20050709), consumers will end up with better cuts of lamb on their plate, and producers with more money in their pockets.

"We have joined forces with the Alberta Sheep and Wool Commission, SAF, Lakeland College and Sunterra Meats to try to work on building better lambs, using the Lakeland College ewe flock," explains Gordon Schroeder, General Manager of the Saskatchewan Sheep Development Board. "We are taking six sire breeds to those ewes, and we are tracking their rates of gain and their cutability right through to the plant. We are trying to determine what is required to build that top quality carcass that can get us really good cutability at the plant."

This matters, explains Schroeder, because the slaughter plant pays a premium for carcasses that index over 100 per cent.

"So we are trying to get some data and figure out a way for lamb producers to get that premium pricing all the time," he says. "You see, a carcass of average quality is called 100 per cent index. If you can produce a carcass that has more cutability, meaning better traits, they will pay a premium on those—a percentage over the average price."

This project involves a multilevel partnership. Staff at Lakeland College —including veterinarians—are working with the students at Lakeland to provide the labour.

"They are handling the flock, doing the weighing, the breeding and caring for the flock. Once these animals reach slaughter weight, they will be transported to Sunterra meats for further tests around cutability." Sunterra Meats in Innisfail, Alberta is the only federally licensed lamb cutting plant in Western Canada.

The project will be conducted over three years. Schroeder looks forward to obtaining the results. He says this is the only project of this type going on in Canada.

"This is why we have partnered with other jurisdictions. Our industry has to build a quality carcass and we have to have consistent quality. So we must acquire the knowledge and provide that data to producers."

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**WATCH FOR CROWN RUST ON OATS IN THE SOUTHEAST**

Researchers are warning oat producers to watch for crown rust this season. The level of crown rust has been increasing in recent years in Manitoba and south-eastern Saskatchewan, says Saskatchewan Agriculture and Food Plant Disease Specialist Penny Pearse.

"The crown rust outbreak in 2005 was one of the most severe we've witnessed in many years," she says. "The 2005 season was characterized by late planting of oat, and humid and warm weather conditions that were favourable for crown rust infection. Furthermore, oat cultivars bred for resistance to crown rust are no longer effective at warding off infection, because the rust population has developed new races that have overcome the resistance. Because current oat cultivars are no longer effective at resisting crown rust, growers will need to incorporate other management practices to reduce disease risk."

Crown rust—also known as leaf rust—is caused by the fungus Puccinia coronata f.sp. avenae. The crown rust fungus is specific to cultivated oat, wild oat and a few other wild grasses, and will not infect wheat, barley or rye. "Crown rust reduces oat yield, and causes thin kernels with low test weight. This greatly reduces milling quality. Losses due to the disease can approach 100 per cent if infection is early, if it is a susceptible cultivar, and if weather conditions are favourable for the development and spread of fungal spores," says Pearse. So far, losses have been most severe in Manitoba. The problem area in Saskatchewan will be the southeast, where oat is a preferred crop and is more likely to be exposed to the rust fungus moving in from the south.

Symptoms of crown rust include orange pustules developing on oat leaves. Each pustule contains thousands of spores that can spread to neighbouring plants and produce new pustules in only seven to 10 days under ideal conditions.

This raises the question: why are our current oat cultivars no longer resistant? "Within the rust fungal population," Pearse explains, "there are a number of different races that have evolved to overcome the rust resistance genes in our current oat varieties. Almost all oat cultivars currently grown on the eastern prairies rely on a single gene for resistance: Pc68. The outbreak of oat rust in 2005 proves this gene is no longer effective.

"Dr. James Chong, a pathologist with the Cereal Research Centre in Winnipeg, has determined the frequency of the various rust races collected from infected plants. In 2005, 73 per cent of isolates from cultivated oat were virulent against the Pc68 gene, compared to 39 per cent of isolates from 2004, and only 12 per cent in 2003. This is evidence that the rust race that can overcome the Pc68 gene has increased rapidly in the rust population in only a few years."

The primary means of infection is rust spores floating up from the southern United States on air currents. The onset and severity of any rust infection in the eastern prairies is dependent on what happens to southern crops.

"If there is a high proportion of the race virulent against the Pc68 gene in the rust population developing in the U.S., oat crops on the eastern prairies are likely to suffer," she explains. "The United States Department of Agriculture (USDA) produces a cereal rust bulletin that monitors rust development in the U.S., and we can use it to predict the risk to Canadian crops. To date, rust levels have been reported as low in the southern states; however, this is not a guarantee that some spores won't find their way to Canada later this season. Provincial specialists will continue to keep producers and agronomists updated on the risk in 2006 as the season progresses."

Developing crown rust resistant cultivars is an ongoing battle for cereal breeders. As soon as new cultivars are developed with specific genes for resistance, the rust population begins to develop new races to overcome this resistance. The goal of cereal breeders is to "pyramid" genes for resistance, meaning that several genes are incorporated into one cultivar to extend the breakdown of resistance or to find less specific, moderate genes for resistance that will delay the breakdown.

Two new cultivars, Leggett from Agriculture and Agri-Food Canada in Winnipeg, and Hi-Fi from North Dakota State University , have been registered in Canada , but certified seed is not yet available, explains Dr. Brian Rossnagel, an oat breeder at the Crop Development Centre at the University of Saskatchewan . New sources of resistance have been identified in wild oats collected in Europe , the Middle East and North Africa, and are being incorporated into the breeding programs. Several advanced lines with resistance that have been developed at the Crop Development Centre at the University of Saskatchewan

and Agriculture and Agri-Food Canada are in co-op tests in 2006.

One of the key ways to avoid severe infection is to plant oat crops early.

"By planting early, the crop should be advanced enough by the time the rust spores arrive in the eastern prairies that it will not suffer significant yield or quality loss," Pearse explains. "A second option is for growers to be more selective in the cultivars they choose to plant. Although most of the cultivars depend solely on gene Pc68 and won't be effective, a few other cultivars have other genes. Until Leggett and Hi-Fi are available, the best choices would be slow-rusting cultivars such as CDC Boyer or CDC Dancer.

"Another tool that growers have to manage rust is foliar fungicides. There are a number of fungicides available that contain the active ingredients propiconazole and/or trifloxystrobin. Ideally, you should spray at flag leaf emergence to protect the flag leaf. Rust can develop very quickly, so once the flag leaf is covered with spots, it is too late to apply fungicide."

Oat producers need to be aware that crown rust may be a problem in oats in 2006. Management practices as well as crop scouting should be implemented to reduce risk.

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**IS SUPPLEMENTAL FEEDING OF GRAZING CATTLE FEASIBLE?**

Large numbers of steers are being placed on grass this spring and summer before they are moved to feedlots for finishing. Some of the questions that usually get asked are: what rate of gain can be expected from such cattle? Will providing supplemental feed result in greater gains than grazing the forages alone?

Saskatchewan Agriculture and Food Livestock Development Specialist Bill Kowalenko has these answers:

"Two factors come into play when considering the rate of gain in cattle. First, livestock producers should be aware of the nutrient requirements for any given class of cattle at their stage of growth and development. The other important factor is to know the nutritional value of the forage at any given stage of growth. The rate of gain of the cattle can be predicted pretty accurately if one knows the nutritional content of the forage and the cattle's requirements."

Forage quality is highest in the plants' early growth stage when energy, protein, and digestibility will be higher, and the fibre content will be lower.

"As plants mature, the protein and energy drop off and the digestibility also decreases, due to the increased fibre content. For example, crested wheatgrass at the early vegetative stage will have energy of 75 per cent total digestible nutrients (TDN) and a crude protein content of 21.5 per cent. At full bloom, the same grass will have an energy value of 61 per cent TDN and crude protein of 9.8 per cent. As the grass continues to mature, both the energy and protein will continue to drop. Smooth brome at the early vegetative stage has an energy of 73 per cent TDN and crude protein of 21.3 per cent, while at the mature stage of growth the energy will be 53 per cent TDN and crude protein of 6.0 per cent."

Similarly, cattle require higher energy and protein levels in their daily diet when they are younger—and at lighter weights—than when they are older and at heavier weights.

"For example, steers weighing 400 lb. consuming forage with crude protein in the range of 13 per cent would be expected to gain 2.0 lb./day. If the crude protein in the forage being grazed was in the 8.0 per cent range, the expected gain by the same steer would be only 0.5 lb./day."

Proper nutrition dictates that an animal's growth or production can be no greater than that allowed by the most limiting of the essential nutrients, explains Kowalenko.

"If a nutrient is included in an animal's diet at a level that does not meet its requirements, the ability of the animal to use the other nutrients is governed by the level of that limiting nutrient. The two most important nutrients required by growing cattle are energy and protein.

"To expect cattle in the 400 to 600 lb weight range to grow at 2.0 to 2.5 lb./day on a grass-based forage, one would need to maintain the forage in the early vegetative phase to provide the energy and protein that would support that level of performance. If a legume was included as part of the forage supply, gains of 2.5 lb./day or greater may be expected."

Supplementing standing forage is advantageous where it can correct a nutritional deficiency that interferes with forage utilization by the animal.

"Protein supplementation is effective where forages contain less protein than the animals require. Even though there may be adequate amounts of energy in a forage supply, if the protein is deficient for the grazing animal's diet, there will be a reduction in forage intake.

Correcting for low protein content in the diet will result in an increase in forage intake, digestibility and animal gain.

"A report by the Oklahoma Co-operative Extension Service, titled How to Estimate the Value of Supplementing Grazing Stocker Cattle, shows that 'when forage is slightly deficient in protein, you can expect about 0.4 pounds of added weight gain from the first pound of high protein supplement fed. When protein is adequate, you can expect about 0.09 pound of added weight gain from each pound of supplemental energy feed added."

"In their example, they indicate if you correct a minor protein deficiency, one pound of a protein supplement such as cottonseed meal (38 per cent crude protein) should increase gain about 0.4 pound per day," explains Kowalenko. "If the protein level in the diet (forage or forage plus supplement) is adequate, the addition of one pound of corn will likely increase gain by 0.09 pound per day. Adding energy to the daily diet of grazing cattle will result in their substituting the supplement for the forage they consume.

"The nutritional quality of the forage, and the size and age of the cattle grazing it, will determine the level of performance that one can expect to achieve in grazing the forage resource," Kowalenko concludes.

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## PROGRESS IN THE QUEST FOR A MORE EFFECTIVE CONTROL OF GOPHER POPULATIONS

Gophers present a significant problem to agriculture in Saskatchewan and in other North American jurisdictions. Wherever they live, gophers tend to create problems, says Andrew Olkowski, a researcher at the University of Saskatchewan who has been looking for solutions to the gopher problem.

"We proposed to undertake a research project inspired by information that I read in the press several years ago," he says. "People were complaining that the gopher population was growing. I read comments to the effect that poison is not working, or is difficult to get."

As a toxicological researcher, this was a challenge Olkowski could not resist. He and his research team decided to investigate the problem. Why is the gopher population growing despite the efforts to control it?

Saskatchewan Agriculture and Food's (SAF) Agriculture Development Fund helped finance the project (ADF #20020076).

Olkowski assigned his team to some basic investigative work.

"When any toxin enters the body, the gopher's first line of defence is to get rid of the toxin as fast as possible. This happens when the toxin is being metabolized. How fast it is metabolized? That is what pre-determines the effectiveness of the toxin. So essentially, if the toxins that are currently being used on gophers are less effective in some cases, there must be some biological explanation."

Olkowski's project was designed to test all the major pathways that are responsible for breaking down toxic compounds.

"We captured a number of gophers for the study and harvested the liver tissue, then extracted the enzymes that are responsible for detoxification. This gave us a very good idea of how, at what speed, and at what rate those compounds are metabolized. We essentially learned which ones are the compounds that metabolize faster and which are slower; what the gender differences are, and quite a few other things."

Part of this study also compared two different groups in an attempt to determine why the toxins do not work in some situations.

"We wanted to test a group of gophers that were not exposed to toxins in the past, and compare them to another group that was captured from a field where attempts to control them for a number of years had been made. Essentially, one group had been exposed to toxins and the other had not.

"What we found out was quite intriguing. It turned out that animals that were captured from the field, the ones that had been previously exposed, had actually built up quite a bit of resistance—the metabolic pathways in this group of animals were much better equipped to deal with the toxins. They acquired a certain immunity to them."

Olkowski admits that this in itself is not something new, but it is revealing.

"You can actually stimulate a lot of these metabolic pathways in an artificial way. In experiments done on rats, the subjects were given low doses of a drug designed to make them sleep. They acquired such immunity to this drug that other rats that hadn't been exposed to the drug fell asleep rapidly, while the exposed rats were not even losing consciousness. Even humans develop mechanisms to deal with sleeping pills. If used for a long period of time, they become ineffective. It is the same type of mechanism.

"We tested generic pathways that are organised in certain patterns of metabolisms, so some groups can be added to the original chemical to basically facilitate excretion of this chemical. This is a kind of reaction that we call a biotransformation. Usually the aim of this organism is to make the compound less available to the body and more excretable, therefore less toxic." Usually, this would happen because the metabolism would add some function to make it more soluble, more excretable, or it would immobilize some toxic paths of the chemical, explains Olkowski.

"We didn't come up with miracle solutions, but on the basis of this study, we now have enough information to think about designing a new generation of drugs. We know which structures are metabolized faster, and what the gender differences are. We found quite a significant difference between males and females. This can be used as a target."

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